A COMPARATIVE STUDY OF CONVENTIONAL THERAPY VS MODIFIED CONSTRAINT INDUCED MOVEMENT THERAPY ALONG WITH CONVENTIONAL THERAPY IN IMPROVING UPPER EXTREMITY FUNCTION OF STROKE PATIENTS

A dissertation submitted in partial fulfillment of the requirement for the degree of

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ELECTIVE – ADVANCE PT IN NEUROLOGY

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(Affiliated to the Tamil Nadu Dr. M.G.R Medical University, Chennai – 32)

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SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR DEGREE OF "MASTER OF PHYSIOTHERAPY" AT THE TTAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY,
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INTERNAL EXAMINER

EXTERNAL EXAMINER

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR DEGREE OF "MASTER OF PHYSIOTHERAPY" AT THE TTAMIL NADU DR. M.G.R. MEDICAL UNIVERSITY, CHENNAI

DECLARATION

I hereby declare and present my project work entitled "**A COMPARATIVE STUDY OF CONVENTIONAL THERAPY VS MODIFIED CONSTRAINT INDUCED MOVEMENT THERAPY ALONG WITH CONVENTIONAL THERAPY IN IMPROVING UPPER EXTREMITY FUNCTION OF STROKE PATIENTS"** The outcome of the original research work undertaken and carried out by me, under the guidance of Professor **Mrs. R. NAGARANI SHANMUGHAM, MPT., (Ph.D)., RVS COLLEGE OF PHYSIOTHERAPY,** Sulur, Coimbatore.

I also declare that the material of this project work has not formed in any way the basis for the award of any other degree previously from the Tamil Nadu Dr. M.G.R Medical University.

SIGNATURE

ACKNOWLEDGEMENT

I express my thanks to **God Almighty** for providing me the wisdom and knowledge to complete my study successfully.

I acknowledge my sincere thanks to **CHAIRMAN and SECRETARY OF RVS EDUCATIONAL TRUST,** Sulur, Coimbatore for providing the opportunity to pursue my Post graduation studies in their esteemed institution.

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I offer my grateful thanks for all the staff members of physiotherapy rehabilitation centre.

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I offer my thanks and gratitude to our librarians for their supports in providing books to complete my study.

I take this golden opportunity to thank each and every patient who took part in this study for their kind co-operation and needed information.

ABSTRACT

Purpose of the study: To find out effectiveness of modified constraint movement therapy along with conventional therapy on upper extremity function of stroke patients.

METHOD: The study conducted was an experimental approach. Sample of 30 subjects satisfying the criteria were divided into two groups, control (group A) and experimental group (group B).

Control group received only conventional therapy

For experimental group, in addition to conventional physiotherapy, modified constraint induced therapy were given. Treatment was given for 3 weeks. The outcome measure taken was Box and block test and Modified Barthel index.

RESULT: The test used for statistical analysis was paired t test and independent t test. The statistical analysis showed significant improvement in experimental group than control group.

Conclusion: The modified constraint induced movement therapy seemed to be beneficial in improving motor performance of upper extremity in stroke patients

Key words: Stroke, Modified constraint induced movement therapy, conventional therapy.

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INTRODUCTION

Stroke is the sudden loss of neurological function caused by an interruption of blood flow to brain and it is a leading cause of serious long term disabilities, including loss of motor, sensory or cognitive functions. The cerebrovascular accident or Stroke is accompanied by either ischemic or hemorrhagic cerebrovascular lesions. Stroke is the major contributor of mortality and morbidity world wide. A WHO study in 1999 quoted incidence of mortality due to stroke in India to be73/100,000/year. After heart disease, Stroke is the second leading single cause of death with 5.8 million fatal cases per year, 40% of which are in younger than 70years.

The majority of individuals who survive a stroke have minimal to moderate neurological deficits and 50% of them are expected to live more than 5 years. Problems affecting the upper limb following stroke are often persistent and disabling with only 20% to 56% of patients regaining useful upper limb function after three months. Improving upper limb function is therefore often a core element of rehabilitation after stroke in order to maximize patient functional independence and reduce disability.

Approximately 70% of 80% of people who sustain a stroke have upper extremity Impairment. The increasing number of persons surviving with stroke are left with impairment of hand and foot, which ultimately decrease the functional status and quality of life. The prevalence of stroke in India varies in different regions of the country and ranges from 40 to 270 per 1,00,000 population. About 12% of all strokes occur in the populations <40 years of age. Major risk factors identified in India are hypertension (blood pressure>95mmHg diastolic), hyperglycemia, tobacco use, low hemoglobin levels (<10gm%).

Modified Constraint induced movement therapy (mCIMT) is a intensive treatment program that aims to improve the functional use of affected upper limb. It consists of family of treatments. The most frequently used variant involves motor restriction of the unaffected upper extremity by a resting hand splint and sling and training of the affected extremity. It involves three weeks of using restraint on the unaffected arm after stroke for 90% of waking hours in conjunction with this, three weeks of intensive exercise with the affected arm are undertaken for around six hours daily. The exercise program uses the training technique 'shaping'. Shaping involves interacting and useful activities that are progressed in small steps, where only positive feedback is given to the participants. The massed practice of skills is likely to be responsible for the occurrence of use-dependent increase in cortical reorganization and neuroplasticity (ability of the brain to change and repair itself).

Constraint Induced Movement Therapy was developed by Dr. Edward Taub of the University of Alabama in Birmingham. According to him, after a stroke the patient stops using the affected limb because they are discouraged by the difficulty. As a result, a process called "learned non use" sets in furthering the deterioration. It is this process constraint induced movement therapy seeks to reverse.

NEEDS AND SIGNIFICANCE OF THE STUDY

The impairment of upper extremity motor function following stroke is the most deliberating condition for the patients and the recovery of these lost functions are a great challenge for physical therapist. Dysfunction from the upper extremity paresis impairs performance of daily activities such as dressing, bathing, self care and writing, thus reducing functional independence. Hence alternate treatment regimens

are needed to reduce the long-term disability and functional impairment for the upper extremity hemiparesis.

Learned non use is a most common problem seen in stroke. Patients with stroke are used to perform task using their unaffected upper limb and progressively avoid using the affected upper limb resulting in a learned non-use phenomenon. Focus on early training as soon as possible after brain damage to utilize specific windows of opportunity and avoid learned non-use. So there is a great need to rehabilitate the upper extremity and regain the lost motor function within the maximum expected recovery period.

STATEMENT OF THE STUDY

The present investigation is done to understand the role of modified Constraint Induced Movement Therapy on upper extremity function in Middle Cerebral Artery stroke patient.

The study entitled: "Effectiveness of modified Constraint Induced Movements Therapy and Conventional therapy on upper extremity function in stroke patients".

OBJECTIVES OF THE STUDY

- To determine the efficacy of modified constraint induced movement therapy along with conventional physiotherapy in improving upper limb motor function in middle cerebral artery stroke.
- To determine the efficacy of conventional physiotherapy to patients with middle cerebral artery stroke.

HYPOTHESIS

NULL HYPOTHESIS: There is no significant difference in giving Modified constraint induced movement therapy along with Conventional therapy in stroke patients.

ALTERNATE HYPOTHESIS: There is significant difference in giving Modified constraint induced movement therapy along with Conventional therapy in stroke patients.

REVIEW OF LITERATURE

SECTION A-STROKE

SECTIONB- MODIFIED CONSTRAINT INDUCED MOVEMENT THERAPY

SECTION C-CONVENTIONAL THERAPY

SECTION A:

- **E.S Sapna et al. (2009)**

  They suggested that apart from acute stage mortality of >20% stroke survivors frequently exhibit persistent functional impairments that limit quality of life.

- **K O Berg et al. (1972)**

  They concluded that stroke causes problems across multiple systems including motor control, upper extremity function, gait and balance. Impairment resulting from stroke such as sensory, motor and impairment in postural control and balance pose threat to physical safety and can lead to fear of one's safety with self imposed restriction on activities of daily living.

- **World Health Organisation. (1970)**

  Stroke is defined as "rapidly developing clinical signs of focal and global disturbances of cerebral blood function with symptoms lasting 24hours or longer or leading to death with no apparent cause other than vascular origin.

- **T.S Oslen :** He founded that, while the lower extremity functions improve in 89% of patients, upper extremity functions improve only 50% of the patients. The

recovery process of upper extremity functions is often slower than the recovery of lower extremity functions.

SECTION B:

- **YANG Qing-lan et al. (2009)**

  The objective of the study is to "observe curative effect of Constraint Induced Movement Therapy on upper limb function in sub-acte stroke patients". It showed significant increase in upper limb function in sub-acute stroke patients.

- **ZENG Yu-shan. (2009)**

  The study entitled " the effects of Constraint Induced Movement Therapy (CIMT) on upper limb functional recovery and Activity of Daily Living (ADL) improvement in patients with hemiplegic stroke". They concluded that Constraint Induced Movement Therapy is more effective than Routine Rehabilitation Therapy in improving the upper limb motor function and ADL in the patients with Hemiplegic stroke.

- **STELLA De BODE et al.(2009)**

  They describes the feasibility and efficacy of the use of constraint induced movement therapy in 4 individuals who underwent cerebral hemispherectomy. The showed qualitative changes consistent with reorganization of sensorimotor cortical representations of both paretic and nonparetic hands in one isolated hemisphere. The concluded that, CIMT may be feasible method of rehabilitation in individuals with chronic hemiparesis,possibly leading to neuroplastic therapy-related changes in the brain.

- **WANG Wenqing et al.(2008)**

  The objective of the study is "to observe curative effect of Constraint Induced Movement Therapy on the recovery of upper limb moving mode and hand's function of patients with cerebral infraction there were significant improvements in upper limb function after CIMT treatment.

- **Leeman B et al. (2008)**

  The purpose of Constraint Induced Movement Therapy (CIMT) is to stimulate the use of the affected upper arm following stroke and to improve the integration of the arm in activities of daily living. They concluded the efficacy of CIMT seems to be confirmed by the literature and our observations. It is superior to the usual treatment.

- **Marco Caimmi et al.(2008)**

  This preliminary study aims "using Kinematic Analysis to evaluate Constraint Induced Movement Therapy in chronic stroke patients". Concluded that the method of Kinematic Analysis was sensitive for as assessment of motor recovery induced by CIMT. The Kinematic results suggest that the increase in the use of the paretic limb in activities of daily living after the intervention is not only attributable to the patients increased attention to it and better hand dexterity, but it is also a consequence of the improved speed of movement and better co-ordination between shoulder and elbow joints.

- **Linc KC et al.**

The objective of the study is to evaluate the benefits of Constraint Induced Movement Therapy (CIMT) relative to traditional intervention equal in treatment intensity and use of restraint mitt outside rehabilitation on motor performance and daily functions in stroke patients. This is the first randomized controlled trail to show the benefits of CIMT, relative to control treatment equal in amount of therapy in improving motor performance and some aspects of basic and extended activities of daily living.

- **Koyama T et al.(2007)**

The study entitled "effective targets for Constraint Induced Movement Therapy for patients with upper extremity impairment after stroke". Concluded that statistical analysis shows that CIMT is most beneficial for treating hand function, suggesting an efficient application of this treatment.

- **WANG Jun et al. (2007)**

The study entitled "the efficacy of Constraint Induced Movement Therapy (CIMT) on minimum motor criterion of upper-extremity for individuals with hemiparesis after stroke. They concluded CIMT is an efficacious treatment to improve the affected arm in stroke patients.

- **WuCY et al. (2007)**

The study entitled "Kinematic and Clinical Analyses of upper extremity movements after Constraint Induced Movement Therapy in patients with stroke, a randomized controlled trail.. The study shows that there is a differenced in motor control strategies as measured by kinematic variables after CIMT versus Traditional Intervention. In addition to improving motor

performance at the impairment and functional levels, CIMT conferred therapeutic benefits on control strategies determined by kinematic analysis.

- **Ro T et al.(2006)**

  The study entitled "functional reorganization and recovery after Constraint Induced Movement Therapy in subacute stroke". The enlarged motor representation in the lesioned hemisphere for hand movement correlated with improved motor function of the affected hand suggesting a link between movement representation sizes as measured with Transcranial Magnetic Stimulation and functionality. These results suggest that TMS can safely and effectively used to assess brain function in subacute stroke and further suggest that CIMT may enhance cortical/subcortical motor reorganization and accelerate motor recovery when started with in first two weeks after stroke.

- **Jama. (2006)**

  The objective of the study is to compare effects of a two week multisite program of CIMT v/s usual and customary care on improvement in upper extremity function among patients who had a first stroke with in the previous 3 to 9 months.They concluded that CIMT produced statistically significant and clinically relevant improvements in arm motor function that persisted for at least 1 year.

- **WENG Chang-Shui et al.(2006)**

  The objective of the study is "to determine the efficacy of Constraint Induced Movement Therapy (CIMT) on different severity of the motor deficit of upper

extremity after stroke". They concluded CIMT is an effective rehabilitation technique to improve motor function in stroke patients.

- **Bonifer NM.(2005)**

  The objective of the study is "to examine the effects of Constraint Induced Movement Therapy (CIMPT) on chronic to severe upper extremity motor impairment after stroke. "CIMT conferred significant changes in objective measures in subjects with chronic to moderate to severe impairments after stroke.

- **Weng Chaangshui et al. (2004)**

  They conducted a study on efficacy of Constraint Induced Movement Therapy for stroke patients. They concluded that CIMT is an efficacious method of improving function and use of the more affected arms of sub acute and chronic stroke patients.

- **Dromerick A.W et al. (2000)**

  They found that motor dysfunction after unilateral de-afferentation in primates can be overcome by restraining the unaffected limb. Result was a clinical trail of CIM therapy during acute rehabilitation is feasible. Constraint induced movement therapy was associated with less arm impairment at the end of treatment.

- **Desrosiers J et al. (1994)**

  The goal of the present study was to verify the test-retest reliability and construct validity of the BBT with subjects aged 60 and over with upper limb

impairment. The results shows that, the test-retest reliability is high (intra-class correlations coefficients of 0.89 to 0.97) and the validity of the test are shown by significant correlations between the BBT, and upper limb performance measurement and a functional independence measurement.

SECTION C:

⇒R PS Van Peppen et al.(2004)

The objective of the study is to determine the evidence for physical therapy interventions aimed at improving functional outcome after stroke. Results: Based on high-quality randomized controlled trials (RCTs) strong evidence was found in favour of task-oriented exercise training to restore balance and gait, and for strengthening the lower paretic limb. Summary effect sizes for functional outcomes ranged from 0.13 (95% CI 0.03–0.23) for effects of high intensity of exercise training to 0.92 (95% CI 0.54–1.29) for improving symmetry when moving from sitting to standing. Strong evidence was also found for therapies that were focused on functional training of the upper limb such as constraint-induced movement therapy (SES 0.46; 95% CI 0.07–0.91), treadmill training with or without body weight support, respectively 0.70 (95% CI 0.29–1.10) and 1.09 (95% CI 0.56–1.61), aerobics (SES 0.39; 95% CI 0.05–0.74), external auditory rhythms during gait (SES 0.91; 95% CI 0.40–1.42) and neuromuscular stimulation for glenohumeral subluxation (SES 1.41; 95% CI 0.76–2.06). No or insufficient evidence in terms of functional outcome was found for: traditional neurological treatment approaches; exercises for the upper limb; biofeedback; functional and neuromuscular electrical stimulation aimed at improving dexterity or gait performance; orthotics and assistive devices; and physical

therapy interventions for reducing hemiplegic shoulder pain and hand oedema. Conclusions: This review showed small to large effect sizes for task-oriented exercise training, in particular when applied intensively and early after stroke onset.

OPERATIONAL DEFINITIONS:

CONVENTIONAL PHYSIOTHERAPY: A currently accepted and widely used physiotherapy treatment for certain types of diseases based on the results of past research.

Modified Constraint Induced Movement Therapy- Modified Constraint induced movement therapy is a form of therapy that helps stroke and central nervous system damaged victims regain the use of affected limbs.

NERUAL PLASTICITY: The brain's ability to reorganize itself by forming new neural connections throughout life. Neuroplasticity allows the neurons (nerve cells) in the brain to compensate for injury and disease and to adjust their activities in response to new situations or to changes in their environment

MIDDLE CEREBRAL ARTERY STROKE: It is the sudden onset of focal neurological deficit resulting from brain infraction or Ischemia in the territory supplied by the middle cerebral artery.

RESEARCH DESIGN AND METHODOLOGY

4.1 RESEARCH DESIGN:

The type of the study design used for the present study is a randomized pre-test post-test experimental group design. Whole sample was divided randomly into two equal groups. Both groups underwent a pre-test and post-test measurements using Box and Block test and Modified Barthel Index. After pre-test measurement, group A received conventional physiotherapy and group B received Modified Constraint Induced Movement Therapy along with conventional therapy for three weeks. Post-test assessment was done after three weeks.

Group A:

These patients received Conventional Physiotherapy.

Group B:

These patients received Modified Constraint Induced Movement Therapy along with Conventional Physiotherapy.

4.2 STUDY SETTING

This study was conducted in Physiotherapy Rehabilitation Centre-Kunnamangalam, Study duration was one month.

4.3 POPULATION OF THE STUDY

Population for the study was chosen from the patients who were referred for the physiotherapy by neurologist and diagnosed as middle cerebral artery stroke. Both male and female patients were included whose age group was between 50-65 years were selected. Informed consent was obtained from the patient's relatives.

4.4 CRITERIA OF SELECTION:

4.4.1. INCLUSION CRITERIA:

1. AGE: 50-65 Years
2. SEX: Both Males and Females.
3. Duration: 3 to 9 months after stroke.
4. Ability to extend at least 10 degree at the MCP and IP joints and 20 degree at wrist.
5. Patient with stable cardio vascular parameter.
6. Patients diagnosed and reoffered by neurologist as left and right MCA stroke patients.
7. No excessive pain in affected upper extremity as measured by a score of 4 or higher on VAS scale.
8. No visual perceptual problem.
9. Brunstrom scaling, 4.

4.4.2. EXCLUSION CRITERIA

1. Traumatic brain injury.
2. Peripheral neuropathy.
3. Severe cardio vascular condition.
4. Demyelinating disease.
5. Painful joint range of motion.
6. Psychiatric and non-co-operative patients.
7. Inability to extend the wrist for at least 10 degree at MCP and IP joints and 20 degree at wrist.
8. Patients with visual, auditory and vestibular dysfunction.

4.5VARIABLES:

4.5.1. INDEPENDENT VARIABLE:

1. Conventional physiotherapy
2. Modified Constraint Induced Movement Therapy

4.5.2. DEPENDENT VARIABLE

1. Upper limb motor function

STUDY SAMPLING

30 patients satisfying the inclusion criteria were selected and were divided into two groups by random sampling method

Experimental group:B

15 patients received Modified Constraint Induced Movement Therapy along with Conventional Physiotherapy

Control Group: A

15 patients received Conventional Physiotherapy alone.

METHODOLOGY

The patients in Group A (Control group) were given conventional physiotherapy which include active assisted range of motion exercise of right upper and lower extremity for left Middle cerebral artery stroke and left upper and lower extremity for right Middle cerebral artery stroke, functional mobility exercises such as bed mobility exercise, balance training. Each subject in control group received the above treatment once daily 6 days in a week for three weeks and each session approximately 40 minutes. Participants in Group B (Experimental group) were given Modified Constraint Induced Movement Therapy by wearing a sling on their unaffected upper extremity for a goal of 90% of their waking hours over a 3 weeks period, including 3 weekends. Tasks along with Modified Constraint Induced Movement Therapy were Ball squeeze, Combing, Putting cans in a cup board, Stacking blocks, Eating, Rinsing mouth, Sweeping, Removing coin from the purse and Grooming. Each task will be progressed by making the participants reach further or faster, or by using smaller pieces .Each task will be doing 25 times at a time and repeat the same 4 times a day.

TREATMENT PROTOCOL FOR CONVENTIONAL THERAPY

Conventional therapy given for Group A and Group B

A. Passive movement: Four repetitions for each joint to maintain the joint integrity
B. Active assisted range of motion exercise of right upper and lower extremity for left Middle cerebral artery stroke and left upper and lower extremity for right Middle cerebral artery stroke.
C. Strengthening exercise.

D. Spasticity management.

E. Balance training.

F. Gait training.

Each subject in Control group and Experimental group was given the above treatment once daily for 1 hour.

Group B (Experimental Group)

Total duration of mCIMT is 6 hours treatment, in that 2 hours given in hospital setup and rest is given in home setup under supervision of care taker. The upper limb is constraint using a sling for 90% of waking hours for 3 weeks. Group B received 1 hour conventional therapy along with additional 2 hours of mCIMT in hospital setup. In addition, 4 hours treatments were given in home setup under supervision of care taker with home activities. Total duration of treatment is 6 hours/day.

HOSPITAL ACTIVITIES

- Turning pages in a book.
- Proper use of writing utensil (pen, pencil).
- Picking up a cup and bringing it to mouth.
- Opening container. (Lid of bottles) Eating with a fork.
- Holding a book.
- Folding towels.
- Picking up pin and placing it in proper place.

EXERCISE PROTOCOL AT HOSPITAL

First week – 10 repetition of each activity.

Second week – 15 repetition of each activity.

Third week - 15 repetition of each activity.

Total duration of the study was 1month.Data collection was done for 3 weeks.

5 Minutes rest is given after every 15 minutes.

Experimental group was given mCIMT along with conventional treatment.

EXERCISE PROTOCOL AT HOME

HOME ACTIVITIES

- Reaching for and grasping a cup.
- Proper use of eating utensil (spoon, fork).
- Using a hair brush or comb.
- Tying shoes.
- Buttoning a shirt.
- Eating with a fork.
- Brushing teeth.
- Opening and closing door with the use of a key.
- Flipping cards.
- Grasping a can.

In giving mCIMT in home setup while doing home activities

First week – 20 repetitions of each activity

Second week- 25 repetitions of each activity

Third week- 30 repetitions of each activity

5 minute rest is given after every treatment

There should be a care giver to monitor the patient when he/she was doing activities at home.

MEASUREMENT TOOL

Box and Block test:

It measures unilateral gross manual dexterity. It is a quick, simple and inexpensive test. It is composed of a wooden box divided in two compartments by a partition and 150 blocks(2.5cm in size).Wooden block dimension is two containers of 25.4cm each. Administered by asking the client to move, one by one the maximum number of blocks from one compartment of a box to another of equal size, within 60 seconds. It is administered for 2-5 minutes. The box should be placed at the clients midline, with compartment holding the blocks oriented towards the hand being tested. The finger tips must cross the partition when transferring the blocks, and that they do not need to pick up the blocks that might fall outside of the box.

Modified Barthel Index scale:

It measures the extent to which somebody can function independently and has mobility in their activities of daily living (ADL)that is personal hygiene, bathing, self, feeding, toileting, stair climbing, dressing, bowel control, bladder control, ambulation, chair transfer. The index also indicates the need for assistance in care.

Validity and Reliability:

Both Box and Block and Modified Barthel index is a valid and reliable measurement.

MATERIALS USED

1. Sling
2. Box and Block (2.5cm)
3. Stop watch
4. Pen
5. Pencil
6. Glass/Cup
7. Comb
8. Spoon/Fork
9. Brush
10. Shirt, Towel
11. Book
12. Card,Can
13. Evaluation sheet
14. Data collection sheet

DATA ANALYSIS AND INTERPRETATION

1. Arithmetic Mean

$$\overline{X} = \frac{\sum X}{N}$$

Where, $\overline{X}$ = Arithmetic Mean

$\sum X$ = Sum of the variables

N = Total number of variables

2. Standard Deviation (S.D)

$$\text{S.D} = \sqrt{\frac{\sum (x - x)2}{N}}$$

Where, x = the individual score

$\overline{X}$ = the mean score

N = the total number of scores

3. Paired 't' test

$$t = \frac{\bar{d}\sqrt{n}}{s}$$

$$\text{Where, } S = \sqrt{\frac{\Sigma d^2 - (\bar{d}^2)n}{n-1}}$$

$\bar{d}$ = mean of deviation

n = total number of subjects

s = standard deviation

Σd^2 = sum of squared deviation

4. Independent 't' test

$$t = \frac{\bar{x}_1 - \bar{x}_2}{s}\sqrt{\frac{n_1 n_2}{n_1 + n_2}}$$

Where S = $$\sqrt{\frac{\sum (x_1 - \bar{x}_1)^2 + \sum (x_2 - \bar{x}_2)^2}{n_1 + n_2 - 2}}$$

$\bar{X}_1$ = Mean of Control group

$\bar{X}_2$ = Mean of Experimental group

n_1 = Number of Subjects in Control group

n_2 = Number of Subjects in Experimental group

S = Standard Deviation

Data were collected from 30 patients analysed using paired 't' test and Independent 't' test to find out within group difference. All data was analysed using SPSS version 10.0.

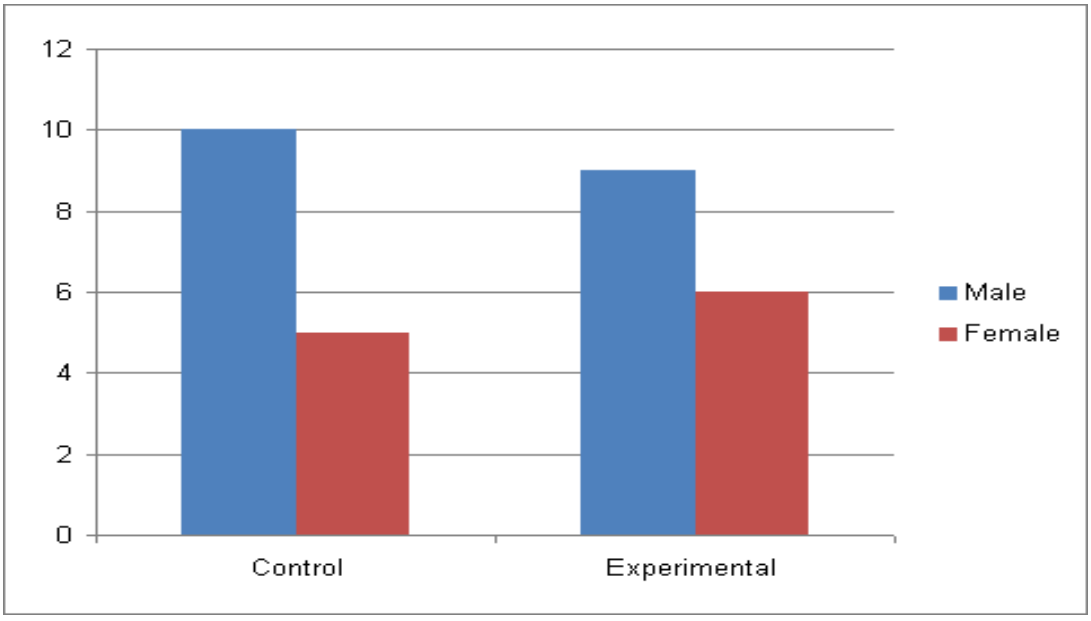
TABLE 1

Demographic presentation of Sex

Content	Control	Experimental
Male	10	9
Female	5	6
Total	15	15

GRAPH 1

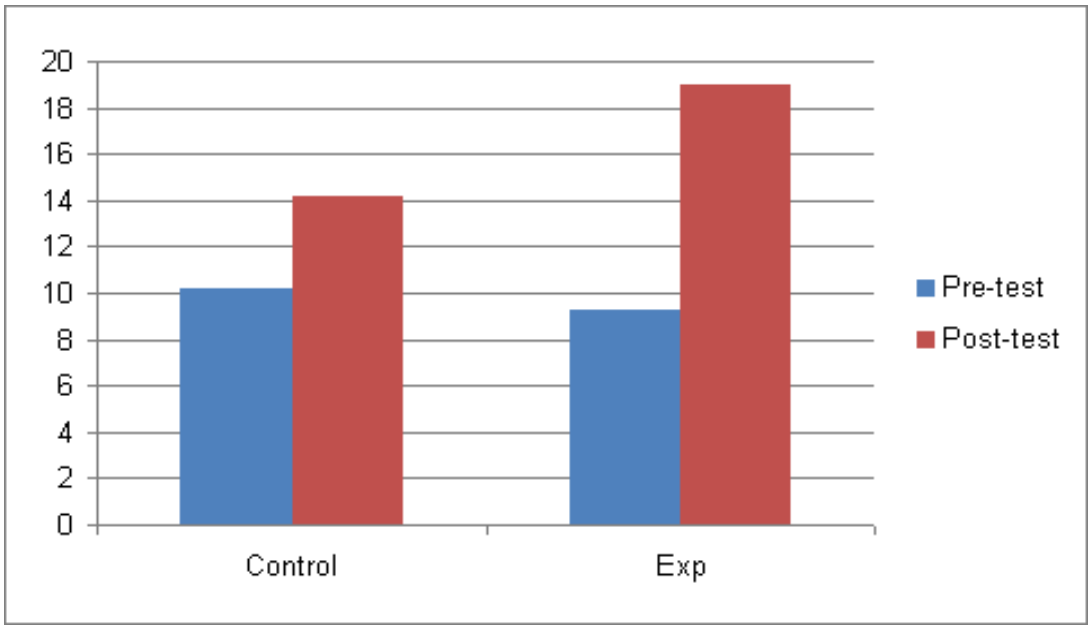
Sex wise distribution in control group and experimental group



The above bar graph shows, in control group 10 males and 5 females were selected; and in experimental group 9males and 6 females were selected.

GRAPH 2

Mean difference of BBT in control group and experimental group



GRAPH 3

Mean difference of MBI in control group and experimental group

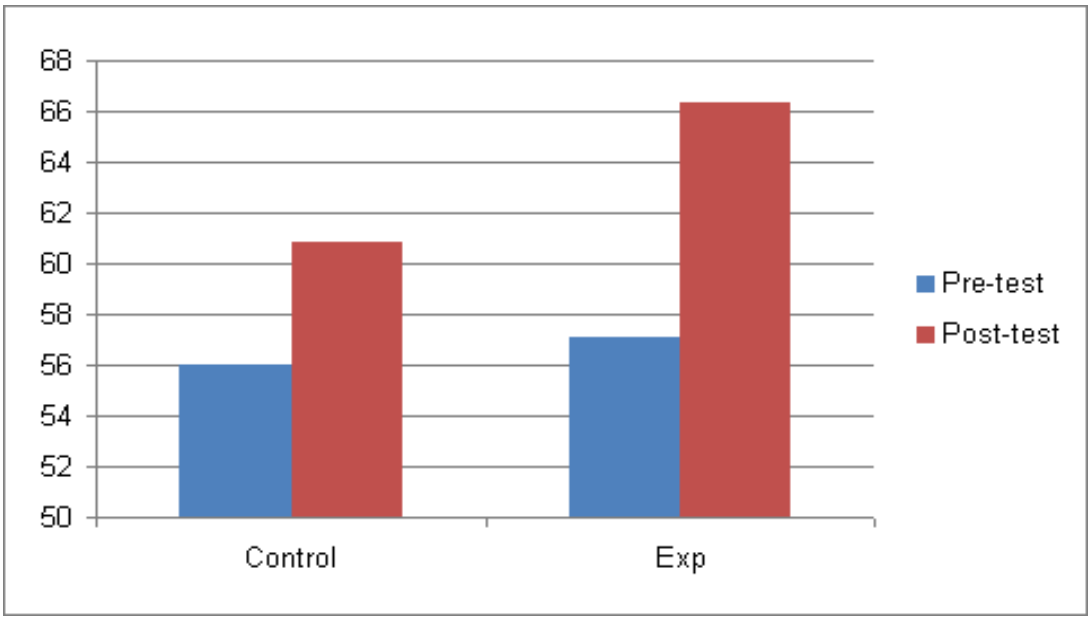


Table 2. PRE TEST MEAN AND STD. DEVIATION OF BBT

GROUP	N (No. of Subjects)	MEAN	STD. DEVIATION
CTRL GP	15	10.2	1.37321
EXP GP	15	9.333	1.04653

Table 3.POST TEST MEAN AND STD. DEVIATION OF BBT

GROUP	N (No. of Subjects)	MEAN	STD. DEVIATION
CTRL GP	15	14.2	2.4571
EXP GP	15	19	2.4285

Table 4.PRE TEST MEAN AND STD. DEVIATION OF MBI

GROUP	N (No. of Subjects)	MEAN	STD. DEVIATION
CTRL GP	15	56	5.3318
EXP GP	15	57.066	4.7729

Table 5. POST TEST MEAN AND STD. DEVIATION OF MBI

GROUP	N (No. of Subjects)	MEAN	STD. DEVIATION
CTRL GP	15	60.8	5.46678
EXP GP	15	66.33	4.4341

INTERPRETATION OF DATA:

STATISTICAL ANALYSIS OF BOX AND BLOCK TESTAND MODIFIED BARTHEL INDEX OF CONTROL GROUP USING PAIRED t TEST

TABLE 6.

GROUP CTRL	MEAN		SD	t	DF	Sig t value
BBT	PRE	10.2	1.3732	10.583	14	4.6096
	POST	14.2	1.5675			
MBI	PRE	56	5.3318	21.5692	14	3.85
	POST	60.8	5.4667			

Interpretation-Box and block test control group-

Above table shows the mean of the pre test data for the control group as 10.2±1.373213 (SD) and post test value as 14.2±1.567528 (SD).The calculated t value is 10.58300524 which is greater than that of table value(2.145). It indicates that there is significant difference between pretest and post values of Box and block test upper extremity in control group.

Interpretation-Modified barthel index control group-

Above table shows the mean of the pre test data for the control group as 56±5.331845(SD) and post test value as 60.8±5.466783(SD).The calculated t value is 21.5692 which is greater than that of table value(2.145). It indicates that there is significant difference between pretest and post test values of MBI upper extremity in control group.

STATISTICAL ANALYSIS OF BOX AND BLOCK TEST AND MODIFIED BARTHEL INDEX OF EXPERIMENTAL GROUP USING PAIRED t TEST

TABLE 7.

GROUP EXP	MEAN		SD	t	DF	Sig t value
BBT	PRE	9.3333	1.046536	30.3289	14	3.58899
	POST	19	1.55838			
MBI	PRE	57.06667	4.77294	34.75	14	5.47
	POST	66.3333	4.434712			

Interpretation-Box and block test experimental group

Above table shows the mean of the pre test data for the experimental group as 9.33±1.04653623 (SD) and post test value as 19± 1.558387 (SD).The calculated t value is 30.32892596 which is greater than that of table value(2.145). It indicates that there is significant difference between pretest and post values of Box and block test upper extremity in experimental group.

Interpretation-Modified Barthel index experimental group-

Above table shows the mean of the pre test data for the experimental group as 57.06±4.77294 (SD) and post test value as 66.33± 4.434712 (SD).The calculated t value is 34.75 which is greater than that of table value(2.145). It indicates that there is significant difference between pretest and post test values of MBI upper extremity in experimental group.

STASTICAL ANALYSIS OF BOX AND BLOCK TEST AND MODIFIED BARTHEL INDEX OF PRE TEST VALUE USING INDEPENDENT T TEST

TABLE 8.

EXPERIMENTAL AND CONTROL GROUP PRE TEST VALUE	MEAN		SD	t	DF	Sig t value
BBT	EXP	9.3333	1.046536	1.944107	28	0.062778
	CTRL	10.2	1.373213			
MBI	EXP	57.06667	4.77294	0.5773	28	0.568352
	CTRL	56	5.331845			

INTERPRETATION-BOX AND BLOCK TEST UPPER EXTRIMITY CONTROL AND EXPERIMENTAL GROUP PRETEST VALUE

Above TABLE shows the mean of pre test data for experimental group as 9.33 ±1.046536(SD)the calculated t value is 1.944107 and control group mean 10.2±1.373213 and calculated t value is 1.944107 for both experimental and control group It indicates that there is no significant difference between experimental and control group.

INTERPRETATION-MODIFIED BARTHEL INDEX UPPER EXTIMITY CONTOL AND EXPERIMENTAL GROUP PRETEST VALUE

Above TABLE shows the mean of pre test data for experimental group as 57.06667±4.77294 (SD) the calculated t value is .05773 and control group mean 56±5.331845 and calculated t value is 0.5773 for both experimental and control group. It indicates that there is no significant difference between experimental and control group

STASTICAL ANALYSIS OF BOX AND BLOCK TEST AND MODIFIED BARTHEL INDEX POST TEST VALUE USING INDEPENDENT T TEST

TABLE 9.

EXPERIMENTAL AND CONTROL GROUP POST TEST VALUE	MEAN		SD	t	df	Sig t value
BBT	EXP	19	1.558387	8.41	28	0.0379
	CTRL	14.2	1.567528			
MBI	EXP	66.333	4.434712	3.04	28	0.005
	CTRL	60.8	5.466783			

INTERPRETATION- BOX AND BLOCK TEST UPPER EXTRIMITY CONTROL AND EXPERIMENTAL GROUP POST TEST VALUE

Above TABLE shows the mean of post test data for experimental group as 19 ±1.558387 (SD) the calculated t value is 8.41 and control group mean 14.2±1.567528 and calculated t value is 8.41 for both experimental and control group.It indicates that there is a significant difference experimental group value than control group.

INTERPRETATION- MODIFIED BARTHEL INDEX UPPEREXTRIMITY CONTOL AND EXPERIMENTAL GROUP POST TEST VALUE

Above TABLE shows the mean of post test data for experimental group as 66.333.±4.434712 (SD) the calculated t value is 3.04 and control group mean 60.8±5.466783 and calculated t value is 3.04 for both experimental and control group. It indicates that there is a significant difference in experimental group value than control group.

RESULTS

BOX AND BLOCK

- Effectiveness of Control Group (Conventional Physiotherapy)

While comparing the pre-test and post test values of control group using Paired 't' test, the calculated t value is 10.58300524 whereas the table value is 2.144786681.Since the calculated value is more than critical value, it states that there is significant difference between the pre-test and post-test values of control group. When comparing the mean values of both, the post-test mean value is 14.2 which are greater than the pre-test mean value 10.2.Hence it confirms that there is a significant improvement in post-test control group than pre-test control group.

- Effectiveness of Experimental Group (Modified Constraint Induced Movement Therapy and Conventional Physiotherapy)

While comparing the pre-test and post test values of experimental group using Paired't' test, the calculated value is 30.32892596 whereas the table value is 2.144786681.. Since the calculated value is more than the critical value, it states that there is significant difference between the pre-test and post-test values of experimental group. When comparing the mean values of both, the post-test mean value 19 which is greater than the pre-test mean value 9.33. Hence it confirms that there is a significant improvement in post-test experimental group than pre-test experimental group.

MODIFIED BARTHEL INDEX

- Effectiveness of Control Group (Conventional Physiotherapy)

While comparing the pre-test and post test values of control group using Paired 't' test, the calculated t value is 21.56922 where as the table value is 2.144787.Since the calculated value is more than critical value, it states that there is significant difference between the pre-test and post-test values of control group. When comparing the mean values of both, the post-test mean value is 60.8 which is greater than the pre-test mean value 56.Hence it confirms that there is a significant improvement in post-test control group than pre-test control group.

- Effectiveness of Experimental Group (Modified Constraint Induced Movement Therapy and Conventional Physiotherapy)

While comparing the pre-test and post test values of experimental group using Paired 't' test, the calculated value is 34.75 whereas the table value is 2.144787. Since the calculated value is more than the critical value, it states that there is significant difference between the pre-test and post-test values of experimental group. When comparing the mean values of both, the post-test mean value 66.33 which is greater than the pre-test mean value 57.06. Hence it confirms that there is a significant improvement in post-test experimental group than pre-test experimental group.

DISCUSSION

The study was an experimental approach to find out the efficacy of mCIMT to improve upper extremity motor performance in subacute stroke patients. The age of subjects was almost identical in both groups about 50-65years. The duration of condition was 3 -9months after onset: 10 males and 5 females in control group and 9 males and 6 females in experimental group .The duration of the treatment was 3 weeks after onset.

Both groups were assessed in the first day and last day of treatment. The tool taken to measure the outcome was Box and block test and Modified barthel index. The instrument has high reliability and good validity for assessing motor function .BBT has impressive test retest reliability inter rater reliability and construct validity.The Box and block test is an efficient measurement tool that can be performed in approximately 5 minutes and it measures unilateral gross manual dexterity.

Another outcome measure is Modified barthel index. This scale has been found to be highly reliable and its validity and usefulness in measuring the progress of patients.

Control group was given ROM exercises, strengthening exercises, spasticity management, Balance training and Gait training. mCIMT were additionally given to experimental group , while rest of treatment were same .

On statistical analysis of Box and block test upper extremity, paired t test showed significant difference in pre and post test scores of both control and experimental groups.

On statistical analysis of Box and block test independent t test showed significant difference in post test scores of experimental group over control group

On statistical analysis of Modified Barthel index. Paired t test show significant difference in pre test and post test scores of both control group and experimental group.

On statistical analysis of Modified Barthel index, Independent t test show significant difference in post test score of experimental group over control group.

Approximately 30% to60% of stroke survivors report persistent end of impairment of upper extremity movement and are unable to use their affected arm in daily activities. Learned non use is a most common problem seen in stroke Patients. They used to perform tasks using their unaffected upper extremity and progressively avoid using the affected upper extremity resulting in al earned non-use phenomenon. Repeated affected limb ADL practice may be critical viable in overcoming learned nonuse.

A primary therapeutic factor in mCIMT appears to be repeated use with the more affected limb which is thought to induce cortical reorganization and correlative functional improvement. Less intensive practice of the affected upper extremity and restraint of the unaffected upper extremity under a variety of functional tasks may provide opportunity for patients to explore optimal ways (i.e., more preplanned control) to achieve various functional tasks .Therefore intensive practice may improve motor planning and promote experience-related adaptations of brain function, leading to more preplanned movement.

Modified Constraint-Induced Movement Therapy (mCIMT) refers to a new set of rehabilitation techniques designed to reduce functional deficits in the more affected upper extremity of stroke survivors. The two key features of mCIMT are restraint of the unaffected hand/arm and increased practice /use of the affected hand/arm. since stroke survivors may experience “learned non-use” of the upper extremity within a short period of time mCIMT is designed to overcome learned non-use by promoting cortical reorganization. Engage in repetitive and intense use of novel tasks that challenge the stroke survivor to acquire necessary motor skills to use the involved upper limb during functional tasks and activities

SUGGESTIONS

1. To establish the efficacy of the treatment, a large sample size study is required.

2. To make the results more valid a long term study may be carried out

3. It can be also given to cerebral palsy childrens.

LIMITATIONS

1. Study was conducted for a short period of time.
2. Since study time was short only limited sample size could be considered for the study.
3. The study assessed only short term progress of the patients.
4. No follow ups could be done.
5. All the measurement were taken manually and this may introduce human error, which could create errors in proving the hypothesis.

CONCLUSION

The study projects that Modified constraint Induced Movement Therapy is an effective exercise regime in improving motor performance of upper extremity.

Modified constraint induced movement therapy is designed to overcome learned none- use by promoting cortical reorganization.

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APPENDIX I

DATA COLLECTION SHEET

Patient Name…….Patient ID……

Date …… ……, Gender…… Age ……..…….

Weight ….. Blood Pressure …….heart rate

Stage of the disease (Brunnstrom stage of scaling) ……..

Duration of the condition…….

Medications Taken Before Test……..

……

Time of Last Medication……

	Before test	After test
Score of Box and block test		
Score of modified barthel index		
Total Motor Score		

APPENDIX-2

NEUROLOGICAL ASSESSMENT FORM

SUBJECTIVE ASSESSMENT

Name :

Age :

Sex :

Dominance :

Occupation :

Address

Chief Complaints :

History of present illness :

Past Medical History :

Prior treatment history :

Drug History :

Family History :

Social History :

Personal History :

Occupational History :

General Examination :

Vital signs

- Temperature
- Pulse rate
- Respiratory rate
- Blood Pressure

Cardio vascular system

Respiratory system

Abdomen

OBJECTIVE ASSESSMENT

ON OBSERVATION:

Head

Eye

Face

Back/Trunk

Built of patient

Gait

Posture

Attitude of limb

Atrophy

Colour of skin

Contour of joints

Deformities

External appliances

Fasciculation

Involuntary movements

Mode of ventilation

Oedema

ON PALPATION:

Tenderness

Warmth

Tone

Oedema

Spasm

Anatomical landmarks

ON EXAMINATIONS:

I Higher Functions:

a) Level of consciousness

Glasgow coma scale (E4 M6 V5)

1) Eye Opening

Spontaneous	-	4
To speech	-	3
To pain	-	2
No response	-	1

2) Best Motor Response

Follows motor commands	-	6
Localizes pain	-	5
Withdrawal	-	4

Abnormal flexion - 3

Abnormal Extension - 2

No response - 1

3) Verbal Response

Oriented - 5

Confused conversation - 4

Inappropriate words - 3

Incomprehensible sounds - 2

No response - 1

b) Orientation

Time

Place

Person

c) Attention

d) Cognition

1) Fund of knowledge
2) Calculation Ability
3) Proverb Interpretation

Mini Mental State Examination test is used to assess cognition

e) Co-operation

f) Memory

Declarative

Non declarative

Long term

Short term

II Cranial Nerve Examination

Nerves	Right	Left
Olfactory		
Optic		
Oculomotor		
Trochlear		
Trigeminal		
Abducent		
Facial		
Vestibulocochlear		
Glosso pharyngeal		
Vagus		
Spinal Accessory		
Hypoglossal		

III Sensory Assessment

Sensory Assessment Scale

1) Intact : Normal, Accurate
2) Decreased : Delayed response
3) Exaggerated : Increased sensitivity or awareness of the stimulation after it has ceased
4) Inaccurate : Inappropriate perception of a given stimulus
5) Absent : No response
6) Inconsistent : Unable to assess

7) **ASIA Sensory Scoring**

0 - Absent

1 - Impaired

2 - Normal

NT - Not testable

Sensation	**Upper extremity**		**lower extremity**		**Trunk**	
	Right	**Left**	**Right**	**Left**	**Right**	**Left**
a) Superficial						
Pain						
Touch						
Temperature						
Pressure						
b) Deep						
Movement Sense						
Position Sense						
Vibration Sense						
c) Combined Cortical						
Two point discrimination						
Graphasthesia						
Stereognosis						
Tactile Localisation						
Double simultaneous stimulation						
Barognosis						
Recognition of texture						

IV Motor Examinations

a) Muscle power

0 - No palpable or observable muscle contraction

1 - Palpable muscle contraction, no observable motion

2 - Full available ROM against gravity minimizes plane, no resistance

3 - Full available ROM against gravity , no resistance

4 - Full available ROM against gravity nearly moderate manual resistance

5 - Full available ROM against gravity, strong manual resistance

Upper Extremity		
Muscle	Right	Left
Shoulder		
Flexors		
Extensors		
Abductors		
Adductor		
Internal rotators		
External Rotators		
Elbow		
Flexors		
Extensors		
Forearm		
Supinators		
Pronators		

Wrist		
Wrist flexors		
Wrist extensors		
Finger		
Finger flexor		
Finger Extension		

Lower Extremity		
Muscle	Right	Left
Hip		
Flexors		
Extensors		
Abductors		
Adductor		
Internal Rotators		
External Rotators		
Knee		
Flexors		
Extensors		
Ankle		
Dorsi flexors		
Plantar flexors		

Foot		
Invertors		
Evertors		
Toe		
Flexors		
Extensors		
Trunk		
Abdominals		
Extensors		

b) Tone

Assess Hyper tonicity and Hypotonicity

Hyper Tonicity

Brunstrom scale-

STAGE 1 Recovery from hemiplegia occurs in a stereotyped sequence of events that begins with a period of flaccidity immediately following the acute episode. No movement of the limbs can be elicited.

STAGE 2 As recovery begins, the basic limb synergies or some of their components may appear as associated reactions or minimal voluntary movement responses may be present. At this time, spasticity begins to develop.

STAGE 3 Thereafter, the patient gains voluntary control of the movement synergies, although full range of all synergy components does not necessarily develop. Spasticity has further increased and may become severe.

STAGE 4 Some movement combinations that do not follow the paths of either synergy are mastered, first with difficulty, then with more ease, and spasticity begins to decline.

STAGE 5 If progress continues more difficult movement combinations are learned as the basic limb synergies lose their dominance over motor acts.

STAGE 6 With the disappearance of spasticity, individual joint movements become possible and coordination approaches normal. From here on, as the last recovery step, normal motor function is restored, but this last stage is not achieved by all, for the recovery process can plateau at any stage.

From Brunnstrom, S: Movement Therapy in Hemiplegia. Harper& Row, New York, 1970, with permission

C Girth Measurement:-

D Deep tendon Reflexes

0	-	No response
1+	-	Present but depressed
2+	-	Average, normal
3+	-	Increased, brisker than average
4+	-	Very brisk, Hyperactive with clonus

Reflex	Right	Left
Biceps (C5, C6)		
Bracheoradialis (C5,C6)		
Triceps (C6,C7)		
Finger flexors (C6-T1)		
Hamstrings (L5,S1,S2)		
Quadriceps (L2,L3 ,L4)		
Tendo Achilles (S1-S2)		
Jaw jerk		

E Superficial reflex

Reflex	Right	Left
Plantar (S1, S2)		
Abdominals		
Above umbilicus (T8- T10)		
Below umbilicus (T10 – T12)		
Corneal		
Cremasteric (L1, L2)		

F Primitive Reflexes

0+ - Absent

1+ - Tone change , slight, transient with no movement of extremities

2+ - Visible movement of extremities

3+ - Exaggerated , full movement of extremities

4+ - Obligatory and sustained movement lasting for more than 10 seconds

Reflexes	Right	Left
ATNR		
STNR		
Tonic Neck Reflex		
Tonic Labrynthine Reflex		
Flexor withdrawal		
Grasp reflex		
Moro		
Startle		
Sucking		
Rooting		

G Range of motion

Joint	Right	Left
Shoulder		
Flexion		
Extension		
Abduction		
Adduction		
Internal rotation		
External rotation		
Elbow		
Flexion		
Extension		

Fore arm		
Supination		
Pronation		
Wrist		
Flexions		
Extension		
Radial deviation		
Ulnar Deviation		
Finger		
Flexion		
Extension		
Hip		
Flexion		
Extension		
Abduction		
Adduction		
Internal rotation		
External rotation		
Knee		
Flexion		
Extension		

Ankle		
Dorsi flexion		
Plantar flexion		
Foot		
Inversion		
Eversion		
Neck		
Flexion		
Extension		
Side flexion		
Rotations		
Trunk		
Flexion		
Extension		
Rotation		
Side flexion		

V Co-ordination

Co-ordination Grading

5 -Normal Performance

4 -Minimal impairment . Able to accomplish, slightly, less than normal speed Requires supervision, minimal contract guarding

3 -Moderate impairment – Able to accomplish active movements are slow, awkward and unsteady, requires moderate contract guarding

2 -Severe impairment - Able only to initiate activity without completion, requires maximal contact guarding

1 -Activity impossible

Non Equilibrium Test

Co-ordination Test	Grade Right	Grade Left
Finger to nose		
Finger to finger		
Finger opposition		
Mass grasp		
Pronation / Supination		
Rebound test		
Tapping (Hand)		
Tapping (Foot)		
Pointing & Past pointing		
Heel to knee		
Drawing a circle (Hand)		
Drawing a circle (Foot)		

Equilibrium Test

Co-ordination Test	Grade
Standing – Normal posture	
Standing – Normal posture with vision occluded	
Standing – Feet together	
Standing – on one foot	

Standing - Lateral flexion	
Tandem walking	
Walking sideways	
Walking backwards	
Walk in a circle	
Walk on heels	
Walk on toes	
Romberg Test	
Sharpened Romberg test	
Stair climbing	

Balance Assessment Scales

Berg Balance Scale

Tinetti Performance Oriented Motor Assessment (POMA)

Timed up and go test (TUGT)

VI Gait Assessment

Observational Gait Analysis

Step Length

Stride Length

Cadence

VII Functional Assessment

Functional Independent Measure (FIM)

Barthel Index

CONSENT FORM

I. ……..voluntarily consent to participate in the research study named

" Comparative study of conventional therapy Vs Modified constraint induced movement therapy and conventional therapy on upper extremity function of stroke patients".

The researcher had explained to me the treatment approach in detail, risk of the participants and had answered the questions related to the research to my satisfaction.

Participant's Signature:

Signature of the Witness:

Signature of the Researcher:

Descriptive data of Control group

Serial number	Age (Years)	Sex	Box and Block test		Modified Barthel Index	
			Pre -test	Post-test	Pre -test	Post-test
1.	61	M	10	14	63	67
2.	59	F	12	16	52	56
3.	63	M	8	13	64	69
4.	65	F	11	15	50	55
5.	55	M	9	14	49	53
6.	50	F	12	15	60	64
7.	62	M	11	14	55	60
8.	60	M	8	11	59	64
9.	57	F	10	14	61	66
10.	65	M	9	13	53	57
11.	61	M	11	15	62	67
12.	52	F	9	17	54	61
13.	64	M	10	14	48	53
14.	59	M	11	12	58	64
15.	63	M	12	16	52	56

Descriptive data of Experimental group

Serial number	Age (Years)	Sex	Box and Block test		Modified Barthel Index	
			Pre-test	Post-test	Pre-test	Post-test
1.	60	M	10	18	59	68
2.	59	M	9	20	54	63
3.	62	F	8	16	49	58
4.	65	M	11	21	57	67
5.	56	F	10	19	64	72
6.	59	M	9	18	52	61
7.	50	F	8	17	63	73
8.	58	M	10	20	58	67
9.	61	F	11	21	56	66
10	63	M	10	19	60	68
11	55	M	8	21	59	67
12.	64	F	10	20	61	69
13.	53	M	9	19	55	66
14.	60	M	8	17	61	71
15.	50	F	9	19	48	59

Modified Barthel Index scale

Item	Unable to perform task	Substantial help required	Moderate help provided	Minimal help required	Fully independent
Personal hygiene	0	1	3	4	5
Bathing self	0	1	3	4	5
Feeding	0	2	5	8	10
Toilet	0	2	5	8	10
Stair climbing	0	2	5	8	10
Dressing	0	2	5	8	10
Bowel control	0	2	5	8	10
Bladder control	0	2	5	8	10
Ambulation	0	3	8	12	15
or Wheelchair*	0	1	3	4	5
Chair/Bed transfer	0	3	8	12	15

*Score only if patient is unable to ambulate and is trained in wheelchair management